MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

DBM5614 – MATHEMATICS

(DA1 & DA2)

21 OCTOBER 2019
2.30 p.m - 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **3** pages excluding cover page and appendix.
2. Attempt **ALL FOUR (4)** questions. The marks distribution for each question is given.
3. Write your answers in the answer booklet provided.
4. Key formulae are given in the Appendix.

Question 1

a) Given the following inequalities.

$$x+2y \geq 10$$
$$y \geq x+2$$
$$x \geq 0, y \geq 0$$

i. Find the x-y intercepts for all the inequalities above. (4 marks)

ii. Sketch and shade the feasible region that satisfies the above inequalities. (3 marks)

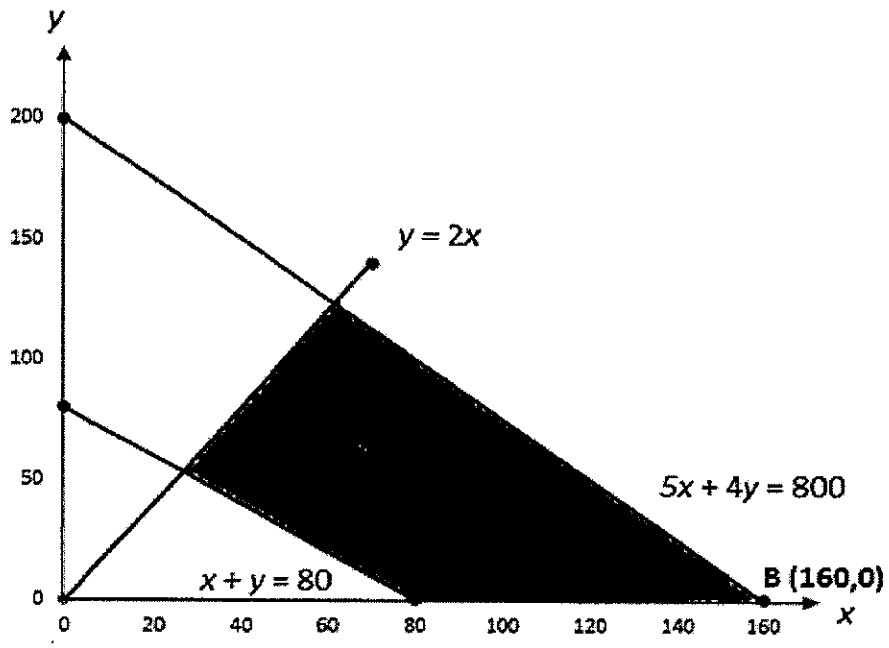
b) The costs of producing Book A and Book B are RM22 and RM42 respectively. Elly wishes to produce x units of Book A and y units of Book B. The total cost is limited to RM 1000. The production machine can produce up to a total of 200 units of Book A and Book B per day. The number of Book B produced is more than Book A.

i. Write three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all the above constraints. (3 marks)

ii. Given the profit for each Book A is RM15 and Book B is RM7, construct the profit function. (1 mark)

iii. If Elly sells a maximum of 140 Book A and 180 Book B, what is the maximum profit? (2 marks)

c) Given a graph of x and y.



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i. Find the coordinate of Point A. (6 marks)
ii. Evaluate each corner point by using the function $Z = 2x + y$. (4 marks)
iii. Which is the maximum and minimum point? (2 marks)

(Total: 25 marks)

Question 2

a) Salmah spent RM11,480 after winning a cash prize of RM65,000 in a National Mathplorace Competition. She put the balance of her cash prize into a saving account with interest rate of 3.77% p.a. compounded monthly. What will be the amount in her saving account after 12 years? (5 marks)

b) Angelina Lim has just started working and would like to buy a car. She has two options.

Option	Description
1	Buy new local car costing RM54,000 by taking car loan at 3.12% simple interest per year.
2	Buy used imported car at a lower price of RM48,000 using personal loan at 8.08% p. a. compounded monthly.

Option 1 requires Angelina Lim to pay a deposit of 10% from the selling price, while Option 2 only requires 5% deposit. If she is willing to pay the loan for 7 years, help her to calculate the followings.

i. The deposit she needs to pay for both options. (2 marks)
ii. The future value of the loan for Option 1. (3 marks)
iii. The monthly payment for Option 1. (2 marks)
iv. The monthly payment for Option 2. (5 marks)
v. Which option is more economical for Angelina Lim? (1 mark)

c) Mugilan will retire in 23 years. He plans to have RM500,000 in his saving account when he retired. He found a bank that offers 4.82% p.a. interest rate compounded quarterly.
i. How much money should he deposit every quarter to reach his retirement goal? (5 marks)
ii. Calculate the amount of interest that he earned? (2 marks)

(Total: 25 marks)

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Question 3

a) Find $\frac{dy}{dt}$ of $y=\frac{1}{t^{2019}}+2019e^{t}-2019\ln t-2019$. (4 marks)

b) Use **Product Rule** to differentiate $y=\left(7-4x^{3}\right)\left(2x-5\right)$. (7 marks)

c) Given a function $y=\frac{1}{3}\left(3t^{3}-5\right)^{-2019}$.

i. Differentiate the above function by using **Chain Rule.** (7 marks)

ii. Hence, from the answer in part (i), identify the value of ***a*** and ***b*** if $\frac{dy}{dt}=\frac{at^{2}}{\left(3t^{3}-5\right)^{b}}$. (2 marks)

d) The total cost function for a manufacturer is given by $C(q)=\frac{2}{5}q^{5}-3e^{q}+6$ where C is in RM. Find the marginal cost when $q=5$. (5 marks)

(Total: 25 marks)

Question 4

a) Evaluate each of the following indefinite integrals.

i. $\int\left(\frac{4}{x^{6}}-\frac{1}{2}e^{x}+\frac{2}{x}-2x^{3}+100\right)dx$ (5 marks)

ii. $\int\left(\frac{xe^{x}-x^{2}+x^{1/4}+x+2}{x}\right)dx$ (5 marks)

b) Calculate $\int_{2}^{4}(x^{2}-6)dx+\int_{2}^{10}4x^{5}dx$. (5 marks)

c) Solve $\int\frac{20}{(5x+2)^{8}}dx$ by using the **Substitution Rule.** (6 marks)

d) Given the marginal cost function is $\frac{dc}{dq}=8q^{3}+2q+10$.

i. Find the cost function. (2 marks)

ii. Evaluate the cost function from 10 to 20 units. (2 marks)

(Total: 25 marks)

End of Paper.

APPENDIX – FORMULAE

Inequality	Solution
$\|x\| < a$	$-a < x < a$
$\|x\| \le a$	$-a \le x \le a$
$\|x\| > a$	$x < -a$ or $x > a$
$\|x\| \ge a$	$x \le -a$ or $x \ge a$

Simple Interest $I = Prt$	**Future Value (Simple Interest)** $FV = PV(1+rt)$
Effective Rate $r_e = \left(1+\frac{r}{n}\right)^n - 1$	**Future Value (Compound Interest)** $FV = PV(1+\frac{r}{n})^{nt}$
Present Value Annuity $A = R\left[\frac{1-(1+\frac{r}{n})^{-nt}}{\frac{r}{n}}\right]$	**Future Value Annuity** $S = R\left[\frac{(1+\frac{r}{n})^{nt}-1}{\frac{r}{n}}\right]$

Derivatives

1. $\frac{d}{dx}(ax^n) = anx^{n-1}$	2. $\frac{d}{dx}[g(x)]^n = n[g(x)]^{n-1} \cdot g'(x)$
3. $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$	4. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$

Logarithmic Functions	Exponential Functions	Chain Rule
$\frac{d}{dx}(\ln x) = \frac{1}{x}$	$\frac{d}{dx}(e^x) = e^x$	$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$
$\frac{d}{dx}\ln u = \frac{1}{u} \cdot \frac{du}{dx}$	$\frac{d}{dx}e^u = e^u \frac{du}{dx}$	

Integration

1. $\int k dx = kx + C$	2. $\int x^n dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$
3. $\int e^x dx = e^x + C$	4. $\int \frac{1}{x} dx = \ln x + C$
Definite Integral, $A = \int_a^b f(x)\,dx = F(b) - F(a)$	